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EDITORIAL

Ultraviolet radiation: ocular risks and prevention

Radiação ultravioleta: riscos oculares e prevenção

Radiación ultravioleta: riesgos oculares y prevención

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Light is a driving force of live, from the most basic function of producing cellular energy to permitting highly sophisticated processes in intelligent life forms[1]. Essential to visual functioning, it brings an unexpected dichotomy to the eye, concomitantly conferring both beneficial and harmful light[1].

Sunlight comprises of electromagnetic radiation ranging from ultraviolet (UV) to infrared (IR)[2]. Ultraviolet radiation (UVR) encompasses wavelenghts from approximately 200 nanometers (nm) to 400 nm[2]. Although a small amount of UV comes from artificial sources, the overwhelming bulk of the UV to which people are exposed comes from the sun[1]. UVR is arbitrarily divided into three bands of different wavelength: UVA 400-320nm, UVB 320-290nm and UVC 290-200nm[3]. UVC is totally absorbed by atmospheric ozone[4]. Thus, the solar UVR of importance to human health consists of UVA and UVB[4].

UV wavelenghts below 300nm are absorbed by cornea[5] and wavelenghts between 300nm and 400nm are predominantly attenuated by the crystalline lens[5,6]. The crystalline lens undergoes significant changes in UV absorbance as its ages, once the lens turns more yellow with age, resulting in greater absorption of UV[7]. So, while younger lenses can transmit wavelengths as short as 300nm, the adult lens absorbs almost all wavelengths up to 400nm[8,9]. Children under age 10, the crystalline lens transmits 75% of UV; in adults over 25, UV transmission through the lens decreases to 10%[10,11].

Not surprisingly, the most common ocular pathologies associated with UV exposure involve eyelid (wrinkles, sunburn, photosensitivity reactions, malignancy – basal cell carcinoma, squamous cell carcinoma), ocular surface (pinguecula, pterygium, climatic keratopathy, keratitis, dysplasia and malignancy of the cornea or conjunctiva), crystalline lens (cortical cataract), uvea (melanoma, pigment dispersion, uveitis, blood-ocular barrier incompetence), vitreous (liquification) and retina (possibly age-related macular degeneration)[12].

The range of the UVR spectrum where the toxicity/exposure ratio presents a higher risk for the eyes is between 300-320nm (310nm peak), however eye protection against UV hazard should include wavelengths between 300-380nm[12]. UVR reaches the eye not only from the sky above but also by reflection from the ground, water, sand and bright surfaces[13]. Protection from UVR can be obtained by using both a brimmed hat or cap and UV absorbing eyewear[13]. A wide-brimmed hat or cap will block roughly 50% of the UVR and reduces UVR that may enter above or around glasses[13]. Ultraviolet absorbing eyewear provides the greatest measure of UV protection, particularly if it has a wraparound design to limit the entry of peripheral rays. Ideally, all types of eyewear, including prescription spectacles, contact lenses and intraocular lens implants should absorb the entire UV spectrum (UV-B and UV-A)[13]. UV absorption can be incorporated into nearly all optical materials currently in use, is inexpensive, and does not interfere with vision[13]. The degree of UV protection is not related to price[13]. Polarization

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or photosensitive darkening are additional sunglass features that are useful for certain visual situations, but do not, by themselves, provide UV protection[13].

Despite what professionals know about the ocular hazards of UV, what the public knows about eye protection is low, compared to the message about skin protection[12]. A survey found that although two-thirds of Americans were aware of the need for eye protection when spending extended time in the sun, only 29% of parents made sure their children wore sunglasses while outdoors[14]. By definition and usage, sun lenses are made exclusively for outdoors purposes[15]. Dermatologists educate their patients every day about UV hazards to the skin without ever making reference to the need for eye protection[16].

Preventing UV damage to the eye involves education of the public and eyecare providers[12]. Public education is the keystone of any serious effort to reduce the effects of UV on ocular health, because implementation of eye protection is ultimately a matter of what individuals do each day-the habit of UV-protective eyewear in real-life situations[12].

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